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ABSTRACT

A quasi-experimental, treatment-control group investigation was designed to test the effects of a preservice training course in direct instruction methodology for secondary education teachers. Previous findings from teacher-effects research and cognitive strategy instruction were translated into two direct instructional models: a model of executive acting directed at well structured skills and a model of strategic acting directed at higher level thinking strategies. Participants were secondary school student teachers from three teacher training colleges in the Netherlands enrolled in either their second or third year. Sixty-four subjects were in the treatment group and 71 were in the control group. The study contained three sub-studies: (1) an observational study using trained observers; (2) an observational study using the supervising teachers, and (3) a questionnaire and interview study focusing on the reactions of the participants to the course. Pre- and post-training comparison of classroom observations by trained observers revealed significantly more effective instruction by the student teachers after training. No treatment effect was found for pupil engagement rates. The ratings from the supervising teachers did not show significantly better use of the recommended instructional skills by the trained student teachers than by the untrained student teachers. (Contains 20 references.) (JB)

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Effective Instruction:
Effects of a pre-service teacher preparation program for secondary schools

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ABSTRACT

A quasi-experimental, treatment-control group investigation was designed to test the effects of a pre-service training course for secondary-education teachers. Previous findings from teacher-effects research and cognitive-strategy instruction were translated into two direct-instructional models: a model of executive acting directed at well-structured skills and a model of strategic acting directed at higher-level thinking strategies. Pre- and post-training comparison of classroom observations by trained observers revealed significantly more effective instruction by the student teachers after training. No treatment effect was found for pupil engagement rates. The ratings from the supervising teachers did not show significantly better use of the recommended instructional skills by the trained student teachers than by the untrained student teachers.

Introduction

One of the main tasks of teachers is to utilize instructional strategies that facilitate pupil learning. In order for learning to occur, various learning functions must be performed by the pupil. Learning functions are defined by Shuell (1988) as psychological functions to be performed by the pupil during learning: establishing appropriate expectations, paying attention to the relevant information, encoding the material in an appropriate manner, repetition and practice, obtaining feedback, evaluating the adequacy of performance, monitoring the learning process, and combining and integrating complex material in a meaningful way. These learning functions can be initiated by the teacher and/or by the pupil. When these functions are fulfilled primarily by the teacher, the learning process is controlled by the teacher (teacher-directed learning). The performance of these functions can also be shared by teacher and pupil together (shared responsibility). When the learning functions are fulfilled primarily by the pupil, the learning process is controlled by the pupil (pupil-directed or autonomous learning). Today, cognitive conceptions of both learning and instruction emphasize the active, constructive, cumulative, and goal-oriented nature of learning (Shuell, 1988). These current conceptions of learning and instruction stress the responsibility of the pupils for their own learning. Although the learning functions can be initiated by either the teacher or the pupil, it is the pupil who must actually carry out the functions.

This view of learning is also embedded in a recent publication by the Dutch governmental committee responsible for the formulation of the guidelines for the restructuring of secondary education (Stuurgroep Profiel Tweede Fase Voortgezet Onderwijs, 1994). The pedagogical, didactic, and organisational changes that this committee proposes are summarized by the construal of "the school as a study house". This includes notions of self-regulated learning, the interactive nature of teaching and learning, and the active participation of pupils in the achievement of learning outcomes. In this conception of the school as a study house, the teacher acts more like a coach than a transmitter of knowledge. Greater pupil responsibility for his or her own learning does not imply that the learning functions may not be initiated by the teacher. The active, constructive process of acquiring new knowledge and skills has to be guided by appropriate forms of instruction including direct explanation, modelling, teacher-guided pupil

practice, focused assistance when pupils experience failures or difficulties, and the provision of support. When a pupil has insufficient prior knowledge of a subject or confronts complex material, the teacher may need to perform the various learning functions at first and gradually shift the control of these learning functions into the hands of the pupil. As pupils acquire more and more domain-specific knowledge and learn to apply different learning strategies and metacognitive skills in a variety of contexts, they will also be better equipped to bear the responsibility for their own learning.

An empirically validated instructional approach for the regulation of the learning functions in the first phases of the learning process is the direct-instructional model. This model was selected for a secondary education teacher-training program. The model proved to be useful in a primary education teacher-training program, and the present study is partly based on the positive findings of this program for primary education (Veenman, Leenders, Meyer, & Sanders, 1993). The teacher-training courses for secondary education lacked such a program, however, so the Protestant Educational Advisory Centre (CPS) and the Department of Educational Sciences of the University of Nijmegen undertook the design of such a program.

Direct instruction

As used in this study, the concept of direct instruction is a label for the constellation of effective teacher behaviours isolated by Rosenshine and Stevens (1986) and Brophy and Good (1986) from correlational and experimental studies. The core of the underlying instructional model consists of six functions: (1) daily review, (2) presenting new material, (3) guided practice, (4) independent practice, (5) providing feedback and correctives, and (6) weekly and monthly review. In the present study, moreover, these steps are incorporated into the direct-instructional model of executive acting and the direct-instructional model of strategic acting.

In education, a great deal of time is devoted to the direct teaching of executive acts. Acts are purposive physical or mental/cognitive operations, and executive acting is directed at the achievement of a particular result or product (Van Parreren, 1988). This manner of acting is characteristic of academic tasks that must be performed according to a fixed scheme or framework. The direct-instructional model of executive acting is best

suited, thus, to skill and knowledge domains that are hierarchically organized and require pupils to learn in a linear sequence. These domains may include mathematical procedures and computations, reading decoding skills, map skills, grammatical concepts and rules, foreign language vocabulary and grammar, science facts and rules.

The six steps in the instructional model of executive acting include the review of the prerequisite skills, the review of relevant past learning, re-teaching when necessary (= daily review), a short statement of the lesson objective and structure, proceeding in small steps but nevertheless at a rapid pace, asking questions to check pupil understanding, highlighting the main points, the provision of concrete examples, demonstration (= presentation), initial pupil practice with teacher guidance, the provision of additional explanation and prompts when necessary, assessment of independent practice (= guided practice), the provision of uninterrupted successful practice directly relevant to the skills and content taught, notifying pupils that their work will be checked (= independent practice), reviewing previously taught material, frequent testing, re-teaching of material missed in tests (= weekly and monthly review), monitoring pupils for systematic errors, and the provision of process feedback, the correction of systematic errors (= feedback and correctives). Research has shown that the direct-instructional model of executive acting to be a successful approach to the teaching of the basic subjects in primary and secondary schools (Rosenshine & Stevens, 1986; Brophy & Good, 1986).

In contrast to executive acting directed at the attainment of a specific goal, strategic acting is aimed at the planning and monitoring of subsequent new acts. One acts strategically to improve the processes necessary for successful performance (Van Parreren, 1988). In instructional settings, strategic acting applies to areas that cannot be broken into smaller parts and are less well-structured skills that do not follow explicit steps, and academic tasks that cannot be performed by following a fixed schema of subskills. For example, essay composition, the writing of term papers, reading comprehension, the analysis of literary or historical trends, and advanced mathematical problem-solving do not depend on a fixed sequence of behaviours. Strategic teaching is therefore directed at the development of higher-level cognitive strategies.

In the direct-instructional model of strategic acting, attention is paid to the expansion of the pupils' knowledge base and also to the expansion of the repertoire of learning strategies. The explicit teaching of strategies and establishment of a metacognitive

understanding are important features of the direct-instructional model of strategic acting. Specific strategies may be extensively modelled by the teacher along with explanations of the use of the complete strategy sequence, and information with regard to the utility of the strategy being taught. The instructional model of strategic acting is based on cognitive strategy instruction (Borkowski & Muthukrishna, 1992; Pressley, Goodchild, Fleet, & Zajchowski, 1989) or what is sometimes called cognitive apprenticeship (Collins, Brown, & Newman, 1989).

A major organizing concept in the teaching of higher-level thinking strategies is that of scaffolding. Scaffolding refers to the instructional support that pupils receive in order to bridge the gap between their current abilities and the goal. The scaffold or support is temporary and highly adjustable; it is used to assist the learners and gradually withdrawn as the learners become more independent (Palinscar & Brown, 1989; Rosenshine & Meister, 1992). Scaffolds may include: modelling of the skills or strategies by the teacher, thinking aloud in order to make the mental processes of an expert "visible" (cf. Schoenfeld, 1985), the provision of procedural facilitators (cf. Bereiter & Scardamalia, 1987), reciprocal teaching (cf. Palincsar & Brown, 1984), prompts, aids, guidance from the teacher, the provision of models of finished work in order to allow the pupils to compare their work to that of an expert, and the provision of checklists in order to assist pupils in the development of a critical eye towards their work. Although the concept of scaffolding can also apply to the direct-instructional model of executive acting, it is most relevant to the teaching of higher-level cognitive skills (Rosenshine & Meister, 1992).

The core of the instructional model of strategic acting is largely identical to that of the model of executive acting: review, presentation of new material in small steps, guiding initial pupil practice, the provision of extensive independent practice, and the provision of feedback and correctives. Based on the work of Borkowski and Muthukrishna (1992), Pressley and Associates (1990), and Rosenshine and Meister (1992), the instructional model of executive acting has been supplemented with elements from the cognitive strategy instruction literature and the literature on cognitive apprenticeship. For example, the teaching function "guided practice" has been extended with such teaching behaviours as: think aloud to make strategies explicit, provide prompts or cue cards, provide half-done examples, gradually increase task complexity, engage in reciprocal teaching, provide procedural facilitators, have pupils work in small groups or pairs, and facilitate application

to new examples. In our study, both the model of executive acting and the model of strategic acting are used to teach effective instruction to pre-service teachers in secondary schools.

Research questions

In the present study, the effects of training based on a direct-instructional model of executive acting and a direct-instructional model of strategic acting are examined. The research questions that guided the study were the following: 1) Do student teachers who participated in the course on effective instruction implement the desired teaching behaviours as presented in the two instructional models? 2) Does the course on effective instruction appear to have an effect on the pupil engagement rates in the classes with student teachers who participated in the course? 3) Do the student teachers and teacher educators appear to value the new course?

Method and instrumentation

Design

The study contained three sub-studies: 1) an observational study using trained observers; 2) an observational study using the supervising teachers, and 3) a questionnaire and interview study focusing on the reactions of the participants to the course. Both of the observational studies were focused on the degree of implementation of the desired teaching behaviours.

The first observational sub-study with ratings by trained observers was set up as a quasi-experimental pre-test-post-test field study with treatment (n = 27) and control (n = 24) groups of student teachers (and the pupils associated with each student teacher).

The second observational sub-study with ratings by the supervising teachers was also set up as a pre-test post-test study with treatment (pre-test n = 18; post-test n = 19) and control (pre-test n = 15; post-test n = 20) groups of supervising teachers.

In order to gain information on the perceptions of the student teachers (n = 64) and the teacher educators (n = 3), questionnaires and interviews were used in a third sub-

study.

Subjects

The participants in the study were secondary-school student teachers from three teacher-training colleges enrolled in either their second or third year. College A was located in the south of the country; college B in the east; and college C in the south-east of the country. In each college, one class was selected for training. All of the student teachers in these three classes (n = 64) were instructed in the direct-instructional models and thus constituted the treatment group. In each college, student teachers from parallel classes (n = 71) followed their traditional educational programs and thus constituted the control group. In all of the three teacher-training colleges, the course on effective instruction was conducted by a single teacher educator. For logistic reasons (budget, time constraints, and available observers), a small set of the student teachers in the treatment classes were randomly selected for observational study. From the three treatment classes, 27 student teachers were thus observed (14 from college A, 6 from college B, and 7 from college C). From the control classes, 24 student teachers were observed (10 from college A, 4 from college B, and 10 from college C).

Prior to and after the course on effective instruction, the supervising teachers were asked to rate the performances of their student teachers. Of the 51 distributed rating scales, 33 were actually returned by the supervising teachers during the pre-test (treatment group n = 18, control group n = 15). With regard to the post-test, 39 of the distributed rating scales were returned by the supervising teachers (treatment group n = 19, control group n = 20) (total response rate of 71%).

Questionnaires were used to obtain information on the student teachers' perceptions of the content of the course (primarily the textbook) and their experiences with the implementation of the two models of direct instruction. The questionnaires were distributed to all of the 64 student teachers who participated in the effective instruction course. Of these student teachers, 44 returned the questionnaire (response rate of 69%). Interviews were conducted with the three teacher educators in order to obtain further information on the implementation of the course and any suggestions for improvement.

Direct Instruction Scale

After each observation, the Direct Instruction Scale (DIS) was used by the observers and supervising teachers to assess the student teacher's behaviour with regard to a number of instructional skills. The five-point scales addressed the skills in the instructional model of executive acting and the instructional model of strategic acting. The variables from the DIS, listed in Table 1, are based on the research of Rosenshine and Stevens (1986), Rosenshine and Meister (1992), Pressley et al. (1989), and an earlier version of the DIS used to evaluate a course on effective instruction for primary school teachers (Veenman, Leenders, Meyer, & Sanders, 1993). Not all of the instructional skills found in the two instruction models were included in the DIS. Only the most representative instructional skills were chosen. Because of the restricted number of observations, moreover, use of the instructional model of executive acting versus the instructional model of strategic acting was not distinguished. Simply one scale was constructed. Although instructional skills such as modelling, thinking aloud, reciprocal teaching, and the use of scaffolds are particularly useful for the direct-instructional model of strategic acting (for teaching higher-level cognitive skills), they can also be applied in the direct-instructional model of executive acting (for teaching well-structured skills). This suggests that a continuum from the teaching of well-structured skills to the teaching of cognitive strategies (Rosenhine & Meister, 1992) may exist rather than a dichotomy between the two instructional models.

Prior to the collection of the observational data, the three observers went through a training program consisting of about 40 hours. The program involved the coding of lesson videotapes as well as the live coding of 17 lessons. Inter-observer reliability checks based on the live coding of 12 lessons (including mathematics, history, and foreign-language teaching) conducted at a school not involved in the study and estimated through analysis of variance for the separate instructional variables ranged from 0.60 to 0.99 (median 0.82). Two items with estimates lower than 0.60 were removed from the scale.

On conceptual grounds, the observational rating scale was broken into two subscales: presentation skills and practice skills. Measures of internal consistency (Cronbach's alpha) were computed for the entire scale and for each subscale for the data obtained from the trained observers and the data obtained from the supervising teachers. Two variables were removed from the scale because of their low item-total correlations. The alpha-coefficients

for the scale and subscales used by the trained observers ranged from 0.70 to 0.83; for the scale and subscales used by the supervising teachers from 0.65 to 0.84. The final DIS consisted of 22 variables (see Tables 1 and 2). The scores were then computed for the entire scale, each subscale and each item.

The observers had no knowledge of the group to which the student teachers had been assigned. After each pre-test and post-test lesson, the supervising teachers were also asked to complete the DIS.

Pupil engagement rates

Every 10 minutes during the lesson taught by the student teacher, the observer stopped note-taking and recorded the number of pupils in the class who were engaged in academic activities (on-task). An on-task score for the class was obtained by dividing the number of pupils engaged in the task by the total number of pupils present, yielding a percentage of pupils classified as on-task. Each observation period lasted approximately 50 minutes and resulted in 4 on-task estimates. The inter-observer reliability for the on-task checks were estimated using analysis of variance (Winer, 1971) and revealed a coefficient of 0.85.

Lesson format

In order to control for the possible influence of lesson content, some guidelines were provided. These guidelines invited the student teachers to use the instructional skills from the two models of direct instruction. The student teachers were asked to teach a lesson that matched with the ongoing curriculum of the cooperating school. These student teachers were also asked to present new learning material and to create opportunities for independent practice or small group work. Finally, all of the student teachers were asked not to give their pupils a dictation or a test.

The instructional course

In the course "Effective Instruction in secondary schools: Learning to teach by means of the direct-instructional model" (Veenman, Bakermans, Franzen & van Hoof, 1994), two

versions of the direct-instructional model were presented: one model for executive acting and one model for strategic acting. The student teachers were also instructed to apply the models presented in the course in the cooperating school. The course consisted of six sections. In section one, topics such as the nature of learning, metacognition, self-regulation, and effective strategy instruction were discussed. In section two, the characteristics of a good strategy user and examples of strategy instruction for different subject areas were provided. In section three, the preparation of a lesson incorporating the steps of the direct-instructional model was discussed. In sections four and five, the model of executive acting and the model of strategic acting were presented. Their use was then illustrated for the teaching of such subjects as language, foreign languages, mathematics, biology, economics, physics, and geography. That is, concrete illustrations of just how the instructional models might be used were clearly presented in these sections of the course. In section six, some of the prerequisites for effective instruction were discussed: effective classroom management and the prevention of disorderly classroom situations.

The course on effective instruction was taught by three different teacher educators at the three different colleges. Prior to the actual start of the course, the educators were specially trained. During a one-day workshop, attention was paid to the contents of the course, the educator's role during the student teachers' training period, and the design of the evaluation study. The course on effective instruction was provided by an experienced educator, and the number of classes devoted to the course itself varied from 3 to 6; each class lasted 90 to 100 minutes. Most of the time was spent on the use of the two instructional models. The three educators were asked to structure their own lessons according to the instructional models described in the course and to clearly model the desired instructional skills in their lessons. The educators nevertheless implemented the course in different ways. In the first two lessons, a great deal of information was generally transmitted by the educator. The presentation of theory also alternated with concrete assignments. In the remaining lessons, practical assignments with respect to the two instructional models were generally given. At locations A and B, practice took the form of teaching each other short lessons. At location C, a great deal of emphasis was placed on the practice of such skills as modelling, procedural facilitation, and reciprocal teaching.

On the average, the student teachers conducted relatively few lessons according to the direct-instructional model at their cooperating schools. The supervising teachers were also

not well informed by the teacher educators or the student teachers with regard to the goals and content of the experimental course on effective instruction. The instructional guide that explained the two instructional models for the supervising teachers was seldom used. Only a small number of the supervising teachers provided their student teachers with guided practice as they themselves practised the instructional skills.

Data collection

Before the start of the course, each student teacher was observed during one lesson (between September and December 1994). After the course had been followed, each student teacher was again observed for one lesson (between January and February 1995). The course on effective instruction was conducted somewhere between October and December 1994; training periods at the cooperating schools varied. In the same period, the evaluation questionnaires were distributed to all of the student teachers who participated in the course on effective instruction. The interviews with the teacher educators took place in March 1995.

The four scores for pupil engagement were averaged for each lesson to produce means for each class and each student teacher. For the observational data collected by the trained observers, the scale scores were computed by adding the values of the DIS items. For the observation data collected by the supervising teachers, the scale scores were averaged because the number of supervising teachers differed at the pre-test and post-test and because all of the supervising teachers did not complete all of the parts of the scale. In testing for possible differences between the treatment student teachers and the control student teachers, a level of significance of 5% was used (one-tailed). The unit of analysis was the student teacher (and her/his class). For a more detailed description of the design, instrumentation, and data collection, see Bakermans, Franzen, and van Hoof (1995).

Results

When comparing the ratings of the trained observers and the supervising teachers for the treatment group with the control group before training, no initial significant differences were found for the scores on the DIS. However, significant pre-test differences between

the treatment group and the control group were apparent for pupil engagement. The pupils in the classes of the treatment student teachers were more on-task at pre-test (84%) than the pupils in the classes of the control student teachers (77%). This difference in time-on-task should therefore be kept in mind when interpreting the results of this study.

A one-tailed *t*-test for paired samples was used to examine the difference between the pre- and post-treatment data for the treatment group. The question was whether the treatment student teachers made better use of the desired behaviours on the post-test than on the pre-test. Independent one-tailed *t*-tests (based on gain scores: post-test scores minus pre-test scores) were used to examine the difference between the treatment and control groups. A summary of the descriptive statistics for each dependent variable from the Direct Instruction Scale (DIS) with the trained observers and the results of these tests are presented in Table 1.

The data displayed in Table 1 show the course on effective instruction to positively affect the instructional behaviours of the student teachers. Significant differences between the pre- and post-test scores for the treatment student teachers were found for the total mean score from the DIS and the two subscales from the DIS: "presentation" and "practice" ($p < 0.01$). The treatment student teachers were found to use the instructional behaviours more effectively at post-test than at pre-test. No significant differences between the pre- and post-test scores for the control student teachers were found for the total mean score from the DIS or the subscale "practice". A significant positive effect for the control student teachers was found for the subscale "presentation" ($p < 0.05$). The control student teachers appeared to use the instructional behaviours during the presentation phase of the lesson more effectively at post-test than at pre-test.

The post-test performance of the treatment student teachers appeared to be significantly better than their pre-test performance on 14 of the 22 ratings (64%) ($p < 0.05$). For the control student teachers, 4 of the ratings were found to be significantly positive at post-test and 2 significantly negative ("provide summaries" and "have pupils help each other").

When the gain scores for the treatment student teachers are compared to those for the control student teachers (see Table 1), significant differences were found for the total mean score and the two subscales from the DIS: "presentation" and "practice". Compared to the control student teachers, the treatment student teachers were rated more effectively

on 4 of the 11 presentation skills ("underline the importance of strategies," "provide summaries," "provide correctives," and "use of the DI-structure"), and on 3 of the 11 practice skills ("provide clear assignments," "active processing of information," and "have pupils plan their own work (self-regulation)."

The SPSSX program MANOVA was used to conduct a number of univariate analyses of variance on the gain scores for the two groups (treatment, control) with the following variables controlled for separately: teacher training college (location A, B, C), student teacher's sex, observer (1, 2, 3), subject matter (languages: Dutch, English, German; science: mathematics, physics, technology; social studies: geography, history, economics), and school type: (low: junior secondary vocational and junior general secondary education; intermediate: senior general secondary education; high: pre-university education). No significant interactions were found between the treatment and control variables for the mean total gain scores from the DIS or for the subscale score "practice." A significant interaction was, however, found between treatment and school type for the subscale for "presentation" ($F = 3.9$; $df = 2,44$; $p < 0.05$). The scores for the treatment student teachers who taught in the 'highest' school type (pre-university education) increased significantly while the scores for the control student teachers who taught in the same school type decreased significantly.

In Table 2, the DIS results from the supervising teachers for the treatment student teachers and the control student teachers are presented. The ratings from the supervising teachers show the student teachers who participated in the course on effective instruction to use the recommended instructional skills significantly better after the course. Significant implementation effects were found for the mean score on the DIS and for the two subscales ($p < 0.05$). Significant differences between the pre- and post-test scores for the control student teachers were also found for the mean score on the DIS and the subscale "practice" ($p < 0.05$). No significant differences were found between pre-test and post-test for the control student teachers on the subscale "presentation."

With regard to the ratings of the performance of the treatment student teachers by the supervising teachers, 7 of the 22 post-measures (32%) were found to be significantly better than the pre-measures. For the control student teachers, 6 of the 22 post-measures were found to be significantly different from the pre-measures.

When the ratings of the treatment student teachers by the supervising teachers are

compared to those of the control student teachers using gain scores, no significant implementation effects were found for the total mean score from the DIS or the two subscales (see Table 2). According to the supervising teachers, the treatment student teachers did not perform better on the desired instructional skills than the control student teachers.

The results in Table 3 show the course on effective instruction to have no significant effect on the pupil engagement rates. After completion of the course, the treatment group pupils exhibited no significant increases in their on-task scores: 84% of the pupils were classified as on-task prior to training and 87% were classified as on-task after training. A significant increase in on-task was only found at observational point 4 (after 40 lesson minutes). A significant effect on pupil engagement rates was nevertheless found for the control group pupils: 77% of the pupils were classified as on-task prior to training and 84% were classified as on-task after training. This increase was particularly evident at observational points 2 and 3 (after 20 and 30 lesson minutes). The difference in the gain scores for the treatment and control group pupils was not significant. Note that the interpretation of the results with regard to the pupil engagement rates is complicated by the fact that the treatment group pupils scored significantly higher at pre-test than the control group pupils.

The results of the questionnaires and the interviews suggest that the course was clearly used by the student teachers. The student teachers who returned the questionnaire reported the content of the course to be very helpful because it provided many concrete, specific, and practical suggestions. The examples in the text were rated as particularly valuable because they provided concrete illustrations of how to implement the particular instructional skills in a variety of subject areas. The instructional model of executive acting was rated by the student teachers as more useful than the model of strategic acting. Most of the student teachers also indicated an intention to apply the acquired instructional skills in their future lessons. The course was rated by the teacher educators as valuable, and they expressed a desire to use the program (or parts of it) in their curriculum for the next year.

Discussion

The results of the present study suggest that the training program on effective instruction can have a positive effect on the instructional skills of student teachers. The trained student teachers were generally rated higher by the trained observers on the Direct Instruction Scale (DIS) than the untrained student teachers. Significant differences between the trained and untrained student teachers were found for the DIS as a whole and for the two subscales "presentation" and "practice." The untrained student teachers also improved their presentation skills but to a lesser extent than the trained student teachers. This progress by the untrained group might be explained by the increased amount of teaching experience between pre- and post-test. The progress made by both the trained and untrained student teachers with regard to the presentation skills might be explained by the general emphasis at teacher-training schools on the presentation of learning materials. The role of the teacher as transmitter of information is traditionally more stressed than the role of the teacher as coach or the supervisor of the learning process. This suggestion corresponds to the outcome of an observational study by Bergen, Van Amelsvoort and Setz (1994) with regard to the instructional practices of secondary school teachers. The instructional behaviour of teachers observed in this study was found to be primarily teacher-directed and focused on the presentation of new learning material. Activities such as the stimulation of pupils to react to each others' contributions, the challenging of pupils to think up concrete examples, and the use of forms of cooperative learning were seldom practised. These observational data were also supported by the pupil perceptions of the instructional behaviour of their teachers. According to the pupils, the teachers appeared to be teaching in a more direct way than in a self-regulatory way. The pupils also perceived their teachers to be more clear in their presentations, more structured, and more stimulating when these teachers were more direct in their teaching. This picture is confirmed by the results of the present study where small differences between the trained and the untrained student teachers with respect to the use of independent-practice skills incorporating pupil-initiated and self-regulatory activities were observed. The instructional skills suggested by the instructional model of strategic acting such as teacher modelling, think-aloud techniques, reciprocal teaching, small groups, cooperative learning, and prompting pupils to plan, evaluate, and regulate their own learning were nevertheless

found to be seldom used by the student teachers. This means that the importance of these skills should receive great emphasis in future implementations of the program.

Contrary to the ratings from the trained observers, the ratings from the supervising teachers revealed no differences between the instructional skills of the trained and untrained student teachers. This difference in the results from the different raters might be explained as follows. Although the supervising teachers received a short description of the instructional skills covered in the training program, only a few of the supervising teachers were actually able to study these skills and consider them in their feedback to the student teachers. The majority of the supervising teachers used the one-sentence description of the instructional skills from the DIS to rate their student teachers and interpreted this short description in their own way. The trained observers, in contrast, knew the content of the training program and were specially instructed in the operational definition of the instructional skills described in the DIS. Moreover, the observations of the trained observers showed the supervising teachers to not always be present when the student-teachers taught their pre- and post-test lessons. The supervising teachers often completed the DIS using global impressions of the qualities of their student teachers, rather. In the present study, more weight was therefore attached to the ratings of the trained observers than to the ratings of the supervising teachers. The student teachers also received little or no feedback with regard to the instructional skills relevant to the two instructional models. A closer relation between the supervising teachers and the student teachers and a closer relation between the teacher educators and the supervising teachers with regard to the content of the training program might have produced significant differences in the supervising teachers perceptions of the trained versus untrained student teachers.

With regard to the pupil engagement rates, no significant differences were found between the trained and untrained student teachers. It should be noted, however, that the pupils in the classes of the treatment student teachers scored significantly higher than the pupils in the classes of the control student teachers at pre-test (84% versus 77%). After completion of the course, the on-task scores of the pupils in the classes of the treatment student teachers increased; given their initially lower on-task score, however, the scores of the control student teachers increased even more than those of the treatment student teachers. The treatment student teachers, nevertheless, appeared to be more successful at keeping the time-on-task levels at a high level throughout the lesson than the control

student teachers. Keeping pupils highly involved, even after 40 minutes, appears to be an effect of training. Given the initial differences in the engagement rates at pre-test, however, the possibility of a training effect on time-on-task levels should be further evaluated in future research.

In light of the higher time-on-task levels at pre-test for the pupils in the classes of the treatment student teachers than for the pupils in the classes of the control student teachers, it can be hypothesized that the pupils in the classes of the treatment student teachers were more willing to learn than the pupils in the classes of the control students. This may have made it easier for the treatment student teachers to implement the desired instructional skills and suggests that the teacher-training effect may have been confounded by a pupil willingness to listen attentively to the student teacher and perform the assigned tasks.

In retrospect, the training of the teacher educators appears to have been too short. Discussions with the student teachers showed no employment of modelling techniques by the educators to make the instructional skills explicit. The knowledge-transmission model of instruction used to train the teacher educators in the present study did not appear to place the educators in control of the metacognitive principles underlying the instructional model of strategic acting.

The teacher educators in the present study were also not in a position to spend much time on the conduct of the training program. The number of hours spent on the training program varied between 5 and 10 hours across the three locations. The conversations with the educators and the student teachers also revealed the conduct of the training program and especially the assignments for the student teachers to require more time. The three educators could not set aside time to coach their student teachers at the cooperating school, moreover. If more time can be devoted to the clinical supervision of the student teachers in the future, greater attention can be paid to the instructional model of strategic acting. The student teachers in the present study appeared to prefer the instructional model of executive acting because of its prevalence in teacher training and secondary teaching.

The results in this study showed the scores on the subscale "presentation" to increase for the trained student teachers teaching in pre-university education schools and decrease for the untrained student teachers in these schools. In other school types, both the trained and untrained student teachers progressed with the trained student teachers progressing more than the untrained student teachers. An explanation for this interaction effect is

difficult to provide. It might be that the pupils in the pre-university education schools are more focused on the acquisition and integration of new information than students in other types of schools and that the trained student teachers dealt with this heightened interest in a more effective manner than the untrained student teachers.

The participants in the present study were student teachers from three different teacher-education colleges enrolled in their second or third year. Colleges A and C included student teachers in their second year of training while college B included student teachers in their third year of training. One might expect the student teachers in their third year of training to perform better than the student teachers in their second year of training although no differences in the DIS scores and pupil engagement rates for these groups were found. Despite their enrollment in the third year, the students in college B had the same amount of field experience as the students in colleges A and C, namely, two years.

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Table I. Mean rates of trained observers on variables of the Direct Instruction Scale (DIS), results of *t*-test on differences between pre- and post-test data, and on gain scores for treatment and control student teachers

DIS/subscales/items	Treatment group		Control group		Pre-post gain		
	Pre-test	Post-test	Pre-test	Post-test	Treatment group	Control group	*t*
DIS total (22 items, α=.83)	54.4	67.4**	52.3	55.9	13.1	3.6	**
Subscale Presentation (11 items, α=.74)	26.5	34.9**	25.5	28.3*	8.4	2.8	**
Daily review	2.6	4.6**	1.5	3.4**	2.0	2.0	
Activating prior knowledge	2.3	2.4	2.5	2.0	0.2	-0.5	
State lesson goals	1.9	2.0	1.7	1.6	0.2	-0.0	
Provide procedural facilitators	2.9	3.6**	2.8	3.1	0.7	0.3	
Model the use of strategies	1.2	1.7*	1.2	1.5	0.5	0.3	
Underline the importance of strategies	1.4	2.2**	1.5	1.5	0.7	-0.0	**
Provide concrete examples	3.9	4.0	3.5	3.9*	0.2	0.5	
Provide summaries	1.2	1.9*	1.7	1.2*	0.7	-0.5	**
Provide process feedback	3.3	4.3**	3.2	3.7*	1.0	0.5	
Provide correctives	3.5	4.5**	3.6	3.8	1.0	0.2	**
Use of the DI-structure	2.4	3.7	2.4	2.5	1.3	0.2	**
Subscale Practice (11 items, α=.70)	27.9	32.6**	26.8	27.6	4.7	0.8	*
Provide clear assignments	4.0	4.8**	4.2	4.3	0.9	0.1	*
Have pupils make their strategies explicit	2.5	3.2*	2.3	2.4	0.7	0.1	
Activate thinking processes	3.3	4.0*	2.9	3.0	0.7	0.2	

DIS/subscales/items	Treatment group		Control group		Pre-post gain		
	Pre-test	Post-test	Pre-test	Post-test	Treatment group	Control group	*t*
Engage in reciprocal teaching	1.2	1.3	1.3	1.4	0.0	0.1	
Stimulate pupil engagement	3.7	4.3**	3.3	3.9**	0.6	0.6	
Checking for understanding	2.3	2.3	1.9	2.0	0.0	0.2	
Effective monitoring (pupils begin work quickly)	3.6	3.8	3.5	3.8	0.2	0.3	
Have pupils help each other	2.1	1.9	2.1	1.6*	-0.2	-0.5	
Active processing of information	3.2	4.1**	3.0	3.1	0.9	0.0	*
Have pupils plan their own work (self-regulation)	1.0	1.7**	1.3	1.1	0.7	-0.2	**
Have pupils evaluate their own work (self-regulation)	1.0	1.2	1.1	1.0	0.2	-0.0	

Note: Treatment group $n = 27$; control group $n = 24$. Sumscores and means for the ratings are based on a five-point scale: 1 = no application of the skill, 5 = clear application of the skill; * $p < .05$; ** $p < .01$

Table II. Mean rates of supervising teachers on variables of the Direct Instruction Scale (DIS), results of *t*-test on differences between pre- and post-test data, and on gain scores for treatment and control student teachers

DIS/subscales/items	Treatment group		Control group		Pre-post gain		
	Pre-test	Post-test	Pre-test	Post-test	Treatment group	Control group	*t*
DIS total (22 items, α=.84)	2.7	3.2*	2.9	3.3*	0.5	0.4	
Subscale Presentation (11 items, α=.79)	2.8	3.3*	2.9	3.3	0.5	0.4	
Daily review	2.7	3.5	2.5	3.7*	0.9	1.1	
Activating prior knowledge	2.7	3.6*	2.9	3.5	0.8	0.6	
State lesson goals	2.8	2.7	2.8	2.7	-0.1	-0.1	
Provide procedural facilitators	3.1	3.7	3.3	3.0	0.6	-0.3	
Model the use of strategies	3.4	3.5	3.1	3.4	0.1	0.4	
Underline the importance of strategies	2.1	2.8	2.4	2.9	0.7	0.5	
Provide concrete examples	3.5	3.5	3.7	3.9	0.0	0.2	
Provide summaries	2.4	2.7	2.0	2.7	0.3	0.7	
Provide process feedback	1.7	3.1**	2.4	2.8	1.5	0.5	
Provide correctives	3.3	3.9*	4.3	4.3	0.6	0.1	
Use of the DI-structure	2.5	2.7	2.6	2.8	0.3	0.2	
Subscale Practice (11 items, α=.65)	2.7	3.1*	2.8	3.3*	0.4	0.4	
Provide clear assignments	3.7	4.1	3.9	4.3	0.4	0.4	
Have pupils make their strategies explicit	1.9	2.9*	2.1	3.1*	0.9	1.1	
Activate thinking processes	3.3	3.5*	2.9	3.5*	0.2	0.7	

DIS/subscales/items	Treatment group		Control group		Pre-post gain		
	Pre-test	Post-test	Pre-test	Post-test	Treatment group	Control group	*t*
Engage in reciprocal teaching	1.6	1.4	1.4	2.0	0.1	0.6	
Stimulate pupil engagement	3.1	3.7*	3.3	3.8	0.5	0.5	
Checking for understanding	2.8	3.1	2.7	3.4*	0.4	0.7	
Effective monitoring (pupils begin work quickly)	3.0	3.9*	4.1	4.3	0.9	0.2	
Have pupils help each other	2.8	2.9	3.4	3.3	0.1	-0.1	
Active processing of information	2.0	2.3	2.3	2.5	0.3	0.3	
Have pupils plan their own work (self-regulation)	2.3	2.8	2.5	3.2**	0.4	0.7	
Have pupils evaluate their own work (self-regulation)	1.8	2.7*	2.1	3.1**	0.9	1.0	

Note: Pre-test: treatment group $n = 18$; control group $n = 15$. Post-test: treatment group $n = 19$; control group $n = 20$. Means for the ratings are based on a five-point scale: 1 = no application of the skill, 5 = clear application of the skill; * $p < .05$; ** $p < .01$

Table III. Average percentages of pupils on-task, results of t-tests on differenes between pre- and post-test data, and on gain scores for treatment and control student teachers

Student teachers' classes	Treatment group		Control group		Pre-post gain		
	Pre-test	Post-test	Pre-test	Post-test	Treatment group	Control group	*t*
Percentage of pupils on-task (whole lesson)	84.2	86.7	76.9	84.4*	2.5	7.5	
Moment 1 (after 10 minutes)	86.6	87.6	81.9	89.5	1.0	7.6	
Moment 2 (after 20 minutes)	86.0	88.2	77.7	86.5*	2.2	8.7	
Moment 3 (after 30 minutes)	86.8	86.9	75.5	83.9*	0.1	8.4	*
Moment 4 (after 40 minutes)	77.5	84.2*	72.1	77.7	6.7	5.4	

Note: * $p < .05$

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